

IMAGE FORMATION APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to an image
formation apparatus which has an image masking control
function for performing masking not to write an image
in a non-image area, its image masking control method,
and a recording medium in which an image masking
10 control program has been recorded.

Related Background Art

Conventionally, an image formation apparatus such
as an electrophotographic laser beam printer, a digital
copying machine or the like has an image writing range
15 which has been determined according to a sheet size.
If image writing exceeds this image writing range, an
image overreaches a sheet, toner adhered to the
overreached part then adheres to a photosensitive drum,
and the toner adhered to the drum further adheres to a
20 transfer roller, whereby this roller is polluted. Such
a state is explained in, e.g., Japanese Patent
Application Laid-Open No. 2-226262 (referred as JPA
'262 hereinafter) by the same assignee of the present
application. However, JPA '262 merely describes that
25 image overreaching in a sub-scanning direction, i.e., a
sheet carrying direction, is prevented. For example,
Fig. 2 of JPA '262 which is a timing chart of an enable

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signal ENBL represents that an image signal is passed only for a period of "true" of the signal ENBL by a signal masking an image signal VDO in the sub-scanning direction.

5 However, image overreaching occurs even in a main-scanning direction. If the image overreaching occurs in the main-scanning direction, the edge of a transfer roller 9 shown in Fig. 1 of JPA '262 is polluted by toner. When a next larger-sized sheet is fed, the
10 toner adhered to the transfer roller 9 is then adhered to the back of the fed sheet, thereby causing a phenomenon called "a back stain". Especially, when printing is performed on both faces of the sheet, this back stain always causes serious image pollution.

15 In recent years, a user's demand to effectively use a sheet by writing an image to the marginal edge of the sheet becomes strong. For this reason, it is necessary to prevent, by performing image masking of high accuracy more than the past, an image writing
20 overrun accurately at the marginal edge of the sheet if an image overreaches an image area on this sheet.

 Further, a case where plural laser beams are used to write a color image is explained in, e.g., Japanese Patent Application Laid-Open No. 57-67375 by the same
25 assignee of the present application. In this case, misregister (or deviation) of each beam makes accurate high-quality masking difficult.

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Further, recently, a multifunctional information output apparatus called a multifunctional printer (MFP) has been in demand. In this MFP, an image scanner is incorporated with a printer, and an image read by the image scanner is output to the printer as it is. When an original is read by the image scanner, if its position is dislocated or its size is small, the periphery of this original is read as black. Thus, in a case where an image signal representing the black-periphery original is printed as it is, toner is not transferred to a sheet but is adhered to a transfer roller when a sheet position is slightly dislocated, thereby causing a back stain of a next sheet. Also, when the original is slightly dislocated, the black part on the periphery of the original is easily read by the image scanner.

SUMMARY OF THE INVENTION

A first object of the present invention is to solve such problems as above, i.e., to appropriately control an image masking area in both a case where an image area is expanded to the marginal edge of a sheet according to an image input to a printer and a case where an image area dares to be limited for self-protection of printing.

A second object of the present invention is to solve such the problems as above. Concretely, in a

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case where data from a host computer is expanded to an image signal for raster scanning and then printed, even if an image area is expanded to the marginal edge of a sheet, a problem is not caused easily, and thus a

5 command to reduce a masking area is received. However, in a case where an image is input from an image reader, reception of a command to reduce a masking area is inhibited for self-protection of a printer.

10 In order to achieve the above objects, the present invention is characterized by providing an image formation apparatus which performs image formation by raster scanning, comprising:

15 a masking means for masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

an input means for inputting the image signal;

a judgment means for judging an input mode of the image signal input by the input means; and

20 a control means for changing an image masking range of the masking means, in accordance with a judged result of the judgment means.

Further, the present invention is characterized by providing an image formation apparatus which performs image formation by raster scanning, comprising:

25 a masking means for masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

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an input means for inputting the image signal;

a judgment means for judging an input mode of the image signal input by the input means; and

5 a control means for inhibiting, in a mode that the image signal is input from an image reader, a change of an image masking range by the masking means, in accordance with a judged result of the judgment means.

Further, the present invention is characterized by providing an image masking control method for an image formation apparatus which performs image formation by raster scanning, the method comprising:

10 a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

15 an input step of inputting the image signal;

a judgment step of judging an input mode of the image signal input in the input step; and

20 a control step of changing an image masking range in the masking step, in accordance with a judged result in the judgment step.

Further, the present invention is characterized by providing an image masking control method for an image formation apparatus which performs image formation by raster scanning, the method comprising:

25 a masking step of masking an image signal on the periphery of a screen in a main scanning direction and a sub scanning direction;

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an input step of inputting the image signal;

a judgment step of judging an input mode of the image signal input in the input step; and

a control step of inhibiting, in a mode that the
5 image signal is input from an image reader, a change of
an image masking range in the masking step, in
accordance with a judged result in the judgment step.

Further, the present invention is characterized by
providing a recording medium which has recorded an
10 image masking control program for performing masking
control of a computer to an image formation apparatus
performing image formation by raster scanning, the
image masking control program causing the computer:

to input an image signal;
15 to judge an input mode of the input image signal;
to change an image masking range in accordance
with a judged result; and
to mask the image signal on the periphery of a
screen in a main scanning direction and a sub scanning
20 direction within the image masking range.

Further, the present invention is characterized by
providing a recording medium which has recorded an
image masking control program for performing masking
control of a computer to an image formation apparatus
25 performing image formation by raster scanning, the
image masking control program causing the computer:

to input an image signal;

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to judge an input mode of the input image signal;
to inhibit, in a mode that the image signal is
input from an image reader, a change of an image
masking range in accordance with a judged result; and
5 to mask the image signal on the periphery of a
screen in a main scanning direction and a sub scanning
direction.

Further, the present invention is characterized by
providing an image formation apparatus comprising:

10 plural input means for inputting image data;
a recording means for recording an image on the
basis of an image signal input by any of the plural
input means;

15 a masking means for masking the image to be
recorded by the recording means; and

a control means for controlling a masking area of
the masking means, on the basis of by which of the
plural input means the image data was input.

20 Further, the present invention is characterized by
providing an image formation apparatus comprising:

a reading means for reading an original image;
a reception means for receiving an image signal
from a host computer;

25 a recording means for recording an image on the
basis of the image signal input by the reading means or
the reception means;

a masking means for masking the image to be

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recorded by the recording means; and

a control means for controlling a masking area of the masking means, on the basis of by which of the reading means and the reception means the image signal was input.

Further, the present invention is characterized by providing an image masking control method comprising:

an input step of inputting an image from any of plural input means for inputting image data;

a masking step of masking the image to be recorded;

a masking control step of controlling a masking area in the masking step, on the basis of by which of the plural input means the image data was input; and

a recording step of recording the image on the basis of an image signal input from any of the plural input means in the input step.

Further, the present invention is characterized by providing an image masking control method comprising:

a reading step of reading an original image;

a reception step of receiving an image signal from a host computer;

a masking step of masking the image to be recorded;

a control step of controlling a masking area in the masking step, on the basis of by which of plural input means the image signal was input; and

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a recording step of recording an image on the basis of the image signal input in the reading step or the reception step.

Further, the present invention is characterized by
5 providing an image formation apparatus comprising:

a scanning means for scanning plural lasers;

an input means for inputting image data
corresponding to the plural lasers; and

a generation means for generating a masking signal
10 to control light emission of each of the plural lasers,
wherein the plural masking signals are generated
by the generation means at mutually independent timing.

Further, the present invention is characterized by
providing an image masking control method comprising:

15 a scanning step of scanning plural lasers;

an input step of inputting image data
corresponding to the plural lasers; and

a generation step of generating a masking signal
to control light emission of each of the plural lasers,

20 wherein the plural masking signals are generated
in the generation step at mutually independent timing.

Other objects and features of the present
invention will become apparent from the following
detailed description and the attached drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing a circuit

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Fig. 2 is a perspective view showing a structure
5 of a laser scanning optical system of the image
formation apparatus according to the first embodiment
of the present invention;

Fig. 4 is a diagram showing an inclination of multibeams of Fig. 2;

15 Fig. 6 is a sectional diagram showing a structure
of the main part of the image formation apparatus
according to the first embodiment of the present
invention;

Fig. 8 is a timing chart showing timing of input and output signals of the distributor 41 of Fig. 7;

25 Fig. 10 is a block diagram showing a structure of
an entire system according to the first embodiment of
the present invention;

Fig. 11 is a flow chart showing a control operation of a CPU 70 of Fig. 1 according to the first embodiment of the present invention; and

Fig. 12 is a flow chart showing a control operation according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the embodiments of the present invention will be explained in detail with reference to the attached drawings.

(First Embodiment)

Fig. 2 shows a structure of a laser scanning optical system of an image formation apparatus according to the first embodiment of the present invention. In this drawing, numeral 1 denotes a multibeam laser which contains plural light emission sources. In the present embodiment, a four-beam laser is used by way of example. Laser beams which are emitted from the multibeam laser 1 are added with symbols L1, L2, L3 and L4 respectively. Numeral 2 denotes a collimator lens, numeral 3 denotes a polygonal mirror, numeral 4 denotes an F- θ lens, numeral 5 denotes a photosensitive drum which receives an image scanned by the laser, and numeral 6 denotes a reflection mirror. Numeral 7 denotes a beam detector (BD) which detects a main-scanning start timing, and

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numeral 8 denotes a slit member which constitutes a slit (i.e., a long and slender strap open). Beams which are condensed by the F- θ lens 4 are added with symbols B1, B2, B3 and B4 respectively.

5 The laser beams passed the collimator lens 2 are deflected by the polygonal mirror 3 toward the direction indicated by an arrow of Fig. 2, condensed by the F- θ lens 4, and then scanned on the photosensitive drum 5. A part of the laser beams condensed by the F- θ lens 4 is reflected at a main-scanning start position by the reflection mirror 6 and then guided to the beam detector 7.

10 Fig. 3 shows a structure of a circuit which processes a signal received by the beam detector 7. In this drawing, numeral 10 denotes an amplifier which amplifies an electrical signal subjected to electrophotographic conversion by the beam detector 7. Numeral 11 denotes a slicer which slices an output signal of the amplifier 10 at a voltage set by a variable resistor 12 to generate a square-wave pulse. Then the square-wave pulse is output to a terminal 13.

20 Fig. 4 shows is a diagram showing an inclination of the multibeam B1, B2, B3 and B4 which are condensed by the F- θ lens 4. A line which is perpendicular to a main-scanning line SL is defined as a line L-L'. Each beam interval of the four multibeam B1, B2, B3 and B4 is assumed to be P1. In this situation, when the

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inclination of the multibeams is set to be an angle α from the line L-L', a scanning line interval on the photosensitive drum 5 can be set to be P_s which is narrower than the interval P_l .

5 However, when the multibeams are inclined as above, timing at which each beam starts the main scanning becomes different. On the photosensitive drum 5, such a timing deviation is about 0.5mm between the adjacent beams. Therefore, when the image is written, 10 it is necessary to correct such the timing deviation.

On the other hand, the generation of the masking signal for limiting an image writing range need not be corrected severely as compared with the image writing. In the range of a sheet-edge margin (ordinarily 3mm or 15 so), even if masking is not performed for each beam, it is possible to generate the masking signals for the respective beams in a mass. However, in a case where it is intended to write the image to the marginal edge of the sheet, it is necessary to eliminate or remove 20 the margin, whereby the above timing between the adjacent beams causes a problem. Thus, it is necessary to accurately perform the image masking for each beam.

Fig. 5 shows a state that each beam passes the slit member 8 of Fig. 2. Here, a beam diameter, a slit 25 interval, an interval (or a distance) between the centers of the adjacent beams, and an interval (or a distance) between the adjacent beams are assumed to be

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dd, ds, db and da, respectively. When the slit interval ds is set to be larger than the beam diameter dd and sufficiently narrower than the interval da, it is possible to separate each beam passed the slit member 8 from others and guide the separated beam to the beam detector 7.

Fig. 6 shows a structure of the main part of the image formation apparatus according to the present embodiment. In this diagram, a folding mirror 30 is added to the optical system. Numeral 31 denotes a sheet feed cassette, and numeral 32 denotes a sheet size sensor. The sheet size sensor 32 reads information of a projection which is provided on the cassette 31 and corresponds to a sheet size, as bit information by using a microswitch or the like. Numeral 33 denotes a sheet feed roller, numeral 34 denotes a register roller, numeral 35 denotes a transfer roller, numeral 36 denotes a development roller, numeral 37 denotes a fixing roller, and numeral 38 denotes a sheet discharge tray.

The beam which was scanned by the polygonal mirror 3 and condensed by the F- θ lens 4 is folded by the folding mirror 30 and irradiated on the photosensitive drum 5, whereby a latent image is formed on the photosensitive drum 5. In synchronism with such an operation, a sheet held in the sheet feed cassette 31 is fed one by one by the sheet feed roller 33, sheet

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feed timing is adjusted by the register roller 34, and then the fed sheet is carried to the photosensitive drum 5. The latent image on the drum 5 is developed by the development roller 36, a toner image obtained by the development is transferred on the sheet by the transfer roller 35, and the sheet is then passed the fixing roller 37, whereby the toner image is heated and pressed. Then the sheet is discharged to the sheet discharge roller tray 38.

Fig. 1 shows a circuit structure of a control system of the image formation apparatus according to the first embodiment of the present invention. In this diagram, numeral 40 denotes a beam detection circuit, numeral 41 denotes a distributor, and numeral 42 denotes an image signal generation unit. The beam detection circuit 40 contains the circuit of Fig. 3 entirely. When the four beams B1 to B4 are input to the beam detector 7, a detection signal having four pulses is output, and the output signal is divided into the four pulses by the distributor 41.

A main-scanning start timing signals which are divided by the distributor 41 are added with symbols BD1, BD2, BD3 and BD4 respectively. When the main scanning is started, the signal BD1 is first detected. The signals BD1 to BD4 are transferred to the image signal generation unit 42 to generate an image signal corresponding to each scanning line. Numerals 94 and

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95 denote connection terminals of the image signal generation unit 42. The connection terminal 94 is connected to a host computer (not shown) which is one of image data generation sources, and the connection terminal 95 is connected to an image reader (not shown) which is the other of the image data generation sources.

The content of the distributor 41 is shown in Fig. 7. A pulse signal which is output from the terminal 13 of the detection circuit 40 is applied to a terminal 14 of Fig. 7. In Fig. 7, numerals 15, 16, 17 and 18 denote gate circuits, numeral 19 denotes a four-value counter, and numeral 20 denotes a decoder. Numerals 21, 22, 23 and 24 denote output terminals of the separated signals BD1, BD2, BD3 and BD4 respectively.

Fig. 8 is a timing chart showing timing of input and output signals of the distributor 41 of Fig. 7. In these diagrams, a pulse wave of a timing signal a represents the BD detection signals B1 to B4 having four pulses applied to the terminal 14. Every time each pulse is applied, the counter 19 makes a count. When the output of the counter 19 is decoded by the decoder 20, signals corresponding to the output of the counter 19 are given at output parts C0, C1, C2 and C3 of the decoder 20. Then, when the output signals of the decoder 20 are transferred to the gate circuits 15 to 18 respectively, timing signals b, c, d and e of

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image masking will be explained with reference to Fig. 9. However, for simplification of the explanation, a method in which only the signal BD1 is used as the beam detection signal will be explained hereinafter.

5 Ordinarily, the distributor 41 is often incorporated in the image signal generation unit 42 because of the following reason. Namely, the image signal generation unit 42 occupies comparatively a large capacity in the image formation apparatus, and a radiation noise is easily generated from this unit 42, whereby this unit 42 is often disposed at the position partitioned by an independent shield case (not shown) in the image formation apparatus. When the beam detection signals BD1 to BD4 are transferred up to this position of the shield case, a delay between the adjacent beams might become a problem. Thus, the four beam detection signals are transferred to the image signal generation unit 42 like a settled pulse, and the transferred settled pulse is then divided into the respective pulses. By doing so, it is possible to more effectively reduce the difference of the individual delay. This is the reason why the distributor 41 is often incorporated in the image signal generation unit 42.

25 First, the beam detection signal BD1 from the distributor 41 is applied to an set terminal S of the flip-flop 51. Then, an operation enable signal CNTENB

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is output from a terminal Q of the flip-flop 51 to the counter 52, whereby counting of a clock applied to the clock terminal 53 is started by the counter 52.

A maximum value output of the counter 52 is
5 returned to a reset terminal R of the flip-flop 51 to reset the flip-flop 51, whereby the level of the signal CNTENB becomes low. Namely, the counter 52 operates while the level of the signal CNTENB is being high. After the counter 52 outputs the maximum value, it
10 returns to an initial state (i.e., zero-count state).

In the above, the example that only the beam detection signal BD1 is extracted by using the distributor 41 was explained. On the other hand, when the set terminal S of the flip-flop 51 is once
15 triggered and then set, the output at the terminal Q does not change until a reset signal is input to the reset terminal R. Thus, even if the output of the detection circuit 40 is directly added to the flip-flop 51 without the distributor 41, the effect obtained is
20 the same.

Next, how to obtain the output from the counter 52 will be explained. The output from the counter 52 is compared with the outputs from the registers 62 to 69 to which data (value) is set by the CPU 70, by the
25 respective digital comparators 54 to 61. When coincidence is obtained in such the comparison, output signals are generated from the digital comparators 54

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5 Namely, the comparator signals COMP1-1 and COMP1-2
from the digital comparators 54 and 55 are applied to
the flip-flop 71, the comparator signals COMP2-1 and
COMP2-2 from the digital comparators 56 and 57 are
applied to the flip-flop 72, comparator signals COMP3-1
10 and COMP3-2 from the digital comparators 58 and 59 are
applied to the flip-flop 73, and comparator signals
COMP4-1 and COMP4-2 from the digital comparators 60 and
61 are applied to the flip-flop 74. It should be
notified that, for simplification, only signal
5 waveforms of the two beams are shown and signal
waveforms of other beams are omitted.

20 Although there are phase deviations, masking signals
/MASK3 and /MASK4 are obtained similarly. It should be
noted that the symbol "/" represents that the level of
the signal in question is low and its signal function
is available. Namely, the masking signal /MASK1
25 represents that the image is masked when the level of
this signal is low, and that the image signal passes
the gate circuits 43 to 46 when the level is high.

Therefore, these gate circuits 43 to 46 correspond to a masking means for the image signal.

On/off timing and widths of the masking signals /MASK1, /MASK2, /MASK3 and /MASK4 can be changed on the basis of the data loaded from the CPU 70 to the registers 62 to 69. The CPU 70 detects a sheet size on the basis of the detection signal sent from the sheet size sensor 32 (Fig. 6), and then loads the data according to the detected size to the registers 62 to 69.

Further, the signal loaded from the CPU 70 to the registers 62 to 69 adds a value corresponding to a positional misregister (deviation) of each beam (i.e., the value corresponding to the distance db between the centers of the adjacent beams in Fig. 5) so as to correct such the positional misregister of each beam. It should be noted that such the positional misregister can be corrected in more detail by separately giving an adjustment value to the CPU 70.

As above, it is possible to generate the accurate image masking signal in the main scanning direction in correspondence with each beam.

It should be noted that the counter 52 can be also used for generation of an unblanking signal and observation of a BD signal period, in addition to the generation of the masking signal.

The image signal generation unit 42 has the

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connection terminal 94 to which a signal from the host computer (not shown) is input. The image signal generation unit 42 expands the signal received from the host computer to the image signal so as to be able to form an image by raster scanning on the photosensitive drum 5.

The image signal generation unit 42 has the other connection terminal 95 to which a signal from the image reader (not shown) is input. The signal from the image reader passes the image signal generation unit 42 as it is. An operation unit 93 is connected to the image signal generation unit 42. It is possible by the operation unit 93 to select and designate whether the image formation apparatus executes a mode to print the data from the host computer or a mode to print the image signal from the image reader. When one of these modes is designated by the operation unit 93, a corresponding mode designation signal is transferred from the image signal generation unit 42 to the CPU 70.

It was explained that the CPU 70 outputs the image masking timing data of the main scanning direction according to the detection signal from the sheet size sensor 32. Further, the CPU 70 outputs an image masking signal /VMASK of the sub scanning direction.

Although this signal /VMASK is substantially the same as the enable signal ENBL described in Fig. 2 of JPA '262 and represented as the image masking signal, the

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polarity of this signal /VMASK is opposite to that of the signal ENBL. Namely, when the level of the signal /VMASK is low, the laser is not permitted to generate a beam for image signal writing. The image masking
5 signal /VMASK is applied to the gate circuits 43 to 46, and the image signal from the image signal generation unit 42 is stopped when the level of this signal /VMASK is low.

Fig. 10 shows a structure of an entire system
10 according to the first embodiment of the present invention. In this diagram, numeral 101 denotes the entirety of the image formation apparatus, numeral 96 denotes a host computer which is connected to the connection terminal 94, and numeral 97 denotes an image
15 reader which is connected to the connection terminal 95. Numeral 98 denotes an aggregation of the gate circuits 43 to 46 of Fig. 1, and numeral 99 denotes an aggregation block of the laser drivers 47 to 50 and the laser 1 of Fig. 1. Numeral 100 denotes a masking
20 signal generation unit which is an aggregation of the counter 52 and its peripheral logical circuits 54 to 74 of Fig. 1. Fig. 10 shows the relation of the image formation apparatus 100, the host computer 96 and the image reader 97.

25 Next, a process operation which is performed by the CPU 70 when it receives the mode designation signal from the image signal generation unit 42 will be

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explained with reference to a flow chart of Fig. 11.

First, in a step 101, the image input mode designation signal is received from the image signal generation unit 42. Then, in a step 102, it is judged whether the designated mode is to designate data image input from the host computer 96 or the image reader 97. If judged that the designated mode is to designate the data input from the host computer 96, then in a step 103 on/off timing data of the image masking signal which accords to the sheet size sent from the sheet size sensor 32 and by which the image masking area of the main scanning direction is reduced as much as possible (i.e., the image masking signal by which the image can be formed up to the sheet edge) is loaded to an internal memory (not shown) of the CPU 70.

Further, the signal which is loaded to the internal memory of the CPU 70 adds a value corresponding to the positional misregister (deviation) of each beam (i.e., the value corresponding to the distance db between the centers of the adjacent beams in Fig. 5) so as to correct such the positional misregister of each beam. Further, on/off timing data of the image masking signal which accords to the sheet size and which the image masking area of the sub scanning direction is reduced is loaded to the internal memory of the CPU 70.

On the other hand, if judged in the step 102 that

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When the print end timing is given, the flow advances to a step 109 to set the level of the image masking signal /VMASK to be low in order to perform the image masking in the sub scanning direction. Thus, the gates 43 to 46 are closed.

10 In the present embodiment, the case where the
scanning is performed by using the multibeam was
explained. However, the present invention is of course
applicable to a case where the scanning is performed by
using a single beam. Further, in the present
15 embodiment, a laser beam printer was used as the
printer. However, the present invention is not limited
to this. For example, the present invention is
similarly applicable to a light emission diode array
printer.

Fig. 12 is a flow chart showing a control operation according to the second embodiment of the present invention. It should be noted that, since the latter half of this flow chart is the same as that of Fig. 11 in the first embodiment, the explanation thereof will be omitted. Further, it should be noted that, since the hardware structure of the second

In the first embodiment, the image masking range is enlarged and reduced according to the image input mode. However, in the second embodiment, it is prevented by image masking that the inside of an image formation apparatus is polluted by toner overreaching an image formation area.

On the other hand, in ordinary use, it gives priority to a margin being formed at the sheet edge. Namely, if it is judged in the step 102 that the designated mode is to designate data image input from the image reader 97, and if it is judged in the step 110 that the command to reduce the image masking area is not issued from the operation unit 93 or the host

computer 96, then in a step 104 on/off timing data of
the enlarged image masking signals of the main and sub
scanning directions which accord to the sheet size sent
from the sheet size sensor 32 (i.e., the image masking
5 signal by which the sheet-edge margin can be provided)
is loaded to the internal memory of the CPU 70.

The operations in a step 105 and following steps
are the same as those in the corresponding steps of the
first embodiment.

10 (Other Embodiments)

In the above embodiments, the example that the
four laser beams are used was explained. However, the
present invention is not limited to the number of the
laser beams.

15 Further, in the above embodiments, the operation
that, when the masking signal is generated, all of the
four beams B1 to B4 are detected and the beam detection
signals BD1 to BD4 are then generated respectively
based on the detected beams B1 to B4 was explained.

20 However, it is possible to first detect only the beam
B1 and then generate the beam detection signal BD1
based on the detected beam B1 such that the beam
detection signals BD2 to BD4 delayed from the signal
BD1 at a predetermined time are generated.

25 Further, the present invention is applicable to a
system structured by plural equipments (e.g., a host
computer, an interface device, a reader, a printer, and

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Further, it is needless to say that the object of the present invention can be attained in a case where a recording medium (or a storage medium) recording program codes to realize the functions of the above embodiments is supplied to the system or the apparatus, and a computer (or CPU or MPU) in this system or apparatus reads and executes the stored program codes.

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actual process based on instructions of the program codes and the functions of the above embodiments can be executed by such the process.

As explained above, according to the embodiments, the area in which the image is masked is changed according to the input mode of the image signal.

Namely, in the printer mode that the image signal is input from the host computer apparatus, it expands the image to the marginal sheet edge, while in the mode that the image signal is input from the image reader, it dares to limit the image area for self-protection of the printer. Therefore, the user's demand to effectively use the sheet by writing the image to the marginal sheet edge can be satisfied. Further, in the case where the image signal obtained when the periphery of the original was read to be black is printed as it is, if the sheet is slightly misregistered from its accurate position, the toner is not transferred to the sheet but adhered to the transfer roller, whereby the back stain occurs in the next sheet. However, according to the embodiments, such the drawback can be prevented.

Although the present invention has been explained by using the several preferred embodiments, the present invention is not limited to them. Namely, it is obvious that various modifications and changes are possible in the present invention without departing from the spirit and scope of the appended claims.

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